A TRIGGER ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of International application PCT/DK02/00430 filed June 26, 2002, the entire content of which is expressly incorporated herein by reference thereto, which claims the benefit of US provisional application no. 60/301,695 filed June 28, 2001.

FIELD OF INVENTION

The present invention relates to a trigger assembly for a gun such as, e.g., a pneumatic paint ball gun, which comprises a ram arranged for sliding to and fro in an associated guidance between a retracted position and an advanced position where the ram acted on by a compression spring is opening a gas valve, and a pivotable sear arranged for in a first position to hold the ram in retracted position by means of a first hook of the sear engaging a second hook of the ram and in another position to release said engagement

BACKGROUND

In recent years air gun competition sports has become very popular. The point of such sports is typically to shoot a series of projectiles so as to concentrate them at the centre of a target. Such sports conventionally use air guns that include a trigger mechanism which utilizes the resistant force of a spring to drive a firing pin or piston. However, when aiming a gun equipped with such a system, a loss of alignment occurs between gun sight (the barrel) and target because trigger is pulled with improper force due to the construction of commonly used trigger apparatus, resulting in a loss of accuracy.

A system trying to overcome the above mentioned problems are known from US 5,852,891. This invention basically comprises a pivotally moving sear having multiple pivot pins, one of which is sequentially connected to multiple linkages also having multiple pivot pins. When the trigger assembly is in a state of engagement, the sear is perpendicular to the linkages. By actuation of the trigger, the horizontal alignment of the linkages relative to one

another is slightly broken, resulting in the upset of the perpendicular alignment of the sear relative to the linkages through the multiple pivots.

The known system however has the drawback that it comprises a high number of mechanical parts that correspondingly require a high level of maintenance. Furthermore, since the system is completely mechanical there must still be used a high level of force and the system has a relatively high reloading time. Thus, improvements in these systems are necessary.

SUMMARY OF THE INVENTION

Therefore, the present invention now provides a trigger assembly of the type as mentioned in the opening paragraph, which enables trigger actuation to be effected using a smaller amount of applied force than previously known, which has a lower reloading time than the conventional devices, and which has a simple and inexpensive construction and an assembly which can continuously be used in sport events without the need for expensive and time-consuming maintenance.

The novel and unique features according to the invention include that the trigger assembly further comprises a supporting device for in a first position to support the sear in its first position and in a second position to allow the sear to pivot from the first to the second position, and means which by activating the trigger is arranged for driving the supporting device from its first to its second position. This structure greatly improves trigger actuation using minimal force. Furthermore, the trigger assembly according to the invention can be used by all people, not the least by persons with weak hands or fingers.

The invention also relates to a gun that includes the trigger assembly described herein. The gun may be in the form or an air rifle, air handgun, paint ball gun, or other toy gun.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be explained in greater detail below, describing only an exemplary embodiment with reference to the drawing, in which

Fig. 1 is a cross-sectional view of one embodiment of the trigger assembly according to the invention in an engaged, pre-firing state, and

Fig. 2 shows the same after disengagement.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In an advantageous embodiment, the trigger assembly comprises a spring for biasing the supporting device from its second to its first position, ensuring that only minimal friction is applied during the movement. Furthermore, when the supporting device is formed as a pivoting arm will the movement from the first position when the arm is supporting the sear in its first position to the second position where the sear is allowed to pivot from the first to the second position, only have to be very small, which will lead to very low energy consumption.

To ensure that only a minimal energy consumption is to be used when firing the trigger assembly can the sear for engaging the free end of the pivoting arm have a supporting area formed along a curve which in the second positions of the sear and the pivot arm has at least the same distance from the pivot of the pivot arm as in the first positions. Experiments have shown that an especially preferred embodiment is obtained when the pivot arm is pivoting an angle of between 5 and 15° between the first and second position, leading to very low energy consumption with improved trigger actuation. When a roller or a ball bearing is mounted on the free end of the pivot arm is the friction between the sear and the supporting device minimized which lead to low energy consumption.

Also, when the means for pivoting the supporting device from its first to its second position comprises a solenoid - or a pneumatic cylinder - with an armature having a protrusion abutting the supporting arm, at least one battery, a circuit connecting the battery with the solenoid, and a switch for closing the circuit when being activated by the trigger, can the solenoid or the pneumatic cylinder, due to the minimal force which must be used for pivoting the sear from the first to the second position, be of a very small size. This means that the trigger assembly either can be constructed so that the device has a minimal size, or the extra space can be used to place a larger battery - or number of batteries - in the device giving the trigger assembly a longer lifetime.

The invention can be applied to rifles, air rifles, air hand guns, paint ball guns, toy guns and the like and can be attached to or removed from a gun with great ease.

In the appended drawings, it is assumed that the trigger assembly of Figs. 1 and 2 is attached beneath a typical spring-power air gun. Figs. 1 and 2 show a preferred embodiment

of the trigger assembly 1 according to the invention. The trigger assembly is constructed with a ram 2, a compression spring 3, a pivotable sear 4 and a pivoting arm 5.

The ram 2 is arranged for sliding to and fro in an associated guidance 6 between a retracted position a and an advanced position a' where the ram acted on by the compression spring 3 is opening a gas valve 7. The pivotable sear 4 is arranged for in a first position b to hold the ram 2 in retracted position a by means of a first hook 8 of the sear engaging a second hook 9 of the ram 2 and in another position b' to release said engagement. The pivoting arm 5 supports in a first position c the sear 4 in its first position b and allows in a second position c' the sear 4 to pivot from the first b to the second position b'.

The construction further comprises a solenoid 10, with an armature having a protrusion 11 abutting the pivoting arm 5, two batteries 12, a circuit 13 connecting the batteries with the solenoid 10, and a switch 14 for closing the circuit when being activated by the trigger 15. In Figs. 1 and 2 it is shown that when the user is pressing the trigger 11, this will activate the switch 10 which again will close the circuit 9 and start the shooting sequence.

A short current impulse is given to the solenoid 10 which will bring the protrusion 11 to pivot the pivoting arm 5 from its first position c to its second position c' where the sear 4 is pivoting from its first position b to its second position b'. This will result in that the ram, due to the spring pressure of the spring 3, will move from its retracted position a to the advanced position a' where the gas valve 7 is opened. The opened gas valve 7 will by means of compressed air force the bullet (not shown) to be discharged.

In order for the trigger assembly to recover will the circuit 13 send a current impulse to the solenoid valve which will open the air to the associated guidance 6. This will make the backblock 16 pull the ram 2 back due to the bar 17. When the ram 2 is retracted from position a' to a during this movement will it pass the sear 4. The sear 4 will due to a retracting spring 18 ensure that the sear 4 is pivoted from its second position b' to its first position b. Likewise is the pivoting arm 5 forced by the spring 18 back into its first position c, locking the sear 4 and thereby the ram 2, by engaging the first hook 8 of the sear to the second hook 9 of the ram 2. The construction has now returned to its starting position ready for firing a new bullet.

Since the trigger assembly according to the invention is attached beneath a typical spring-power air gun, for example, with a bullet simultaneously be placed in position for firing, the specific actions in this connection will however depend on the air gun used, but

EXAMPLE:

In the following examples are a WGP Autococker gun used both with the trigger assembly according to the invention and with an conventional trigger assembly.

The firing/reloading time

The firing/reloading time is approximately 0,08-0,1 sec. using the trigger assembly according to the invention, in relation to 0,15-0,2 sec when using the conventional trigger assembly.

Use of applied force on the trigger for firing the gun

The use of applied force on the trigger when firing the gun is approximately 2-5 g with a trigger travel less than 1 mm when using the trigger assembly according to the invention, whereas the applied force with the conventional system is 20-30 g with a 3-5 mm trigger travel.